

② Description of Holography Technique

While there are significant differences in to produce those little logos compared to large white light holograms used for marketing or 3-D volume images for medical similar and can be summarized very briefly. The following is the sort of holography setup that is within the capabilities of a determined amateur:

- A long coherence length laser. For amateur holography, this is typically a polarized red helium–neon (HeNe) laser of 5 to 35 mW or a green single frequency diode pumped solid state (DPSS) laser of up to 100 mW or more. It may also be possible to use some red diode lasers or even cheap red laser pointers, but not all. See the sections below.
 - Typical red (632.8 nm) HeNe lasers: Melles Griot 05-LHP-151, (5 mW), 05-LHP-925 (17 mW), or 05-LHP-927 (35 mW); Spectra-Physics 120 (5 mW), 124 (15 mW), or 127 (35 mW). There are many
 - Some typical single frequency green (532 nm) DPSS lasers: Coherent Compass 215M or 315M (up to 150 mW) or 532 (up to 400 mW). Not all green DPSS lasers are single frequency though. up nowadays are NOT.
- The output of the laser is passed through a beam expander and divided into two parts. The higher the power of the laser, the shorter the exposure – which as will be come evident, is critical.

Suitable lasers include medium to high power HeNe lasers

- The reference beam is sent directly to
- The object beam is sent to scene from the side so that it doesn't hit the holographic film directly. Reflections from the objects of the scene fall on the film producing an interference pattern with the reference beam.
- The holographic film is extremely high per millimeter (!!) since the finest detail that needs to be captured is on the order of the wavelength of the laser light used. As with photographic film in general, the higher the resolution, the slower the film. So, long exposures or very bright lasers are needed!
- Everything is mounted on an optical table that is made as stable as possible since vibrations during the exposure must be minimized. Again, like the resolution of the holographic film, the amplitudes of any unavoidable vibrations must be kept well below the size of the wavelength of the laser light. This usually means either a platform isolated from external vibrations by air cushions, making it very massive, putting everything in a sand-box, or all of the above. Several TON granite slabs are not unheard of and basement locations are generally preferred to wobbly upper stories of a 50 story high-rise!
- Once everything is set up, the studio or lab is darkened, the opaque cover is removed from the film, and time is allowed to pass so that any vibrations resulting from activity can die down. The laser is then turned on or its beam unblocked for the several seconds or minutes in some cases needed for the exposure.

- The holographic film is developed in the normal manner. At this point, the result looks like a black ruined film bleached (the silver is converted into a soluble compound and washed away) leaving just the gelatin but with empty spaces where there were originally silver grains. This provides enough phase contrast to recreate the original interference pattern.
- Under room light, the holographic plate just looks milky with perhaps a hint of rainbow or diffraction effects. If you picked one of these off the street without knowledge that it was a hologram, you would think it was just a dirty piece of glass.
- However, when placed back in the same location as it was during the exposure with the scene objects removed and illuminated just with the laser's reference beam, every aspect of the original scene reappears as if framed by the window of the hologram plate.

(From: Joshua Halpern (vze23qvd@verizon.net).)

As far as a stable optical table goes:

1. You could buy one on eBay. You need to find one near you otherwise the moving costs will kill you to hire riggers. That costs between \$500
2. There are two simple ways to build one. They start with the same base, blocks of stiff styrofoam. The simplest thing then is to put a block of granite or marble on top. Of course, you now have the problem of attaching anything to the marble, but the table will be vibration isolated
3. Otherwise get a thick piece of magnetic steel and put that on top. you can then use magnetic bases. You buy supply place – not an optical supply house which would charge 2 to 3 times the as much.
4. For even better isolation you put a sandbox on top of the styrofoam, fill it with sand (there are grades, you want a grade with fine round kernels). Put a sheet of plastic down before you float the steel/stone on the sand and seal the plastic to the sides of the sandbox to avoid having sand everywhere.

Note that all of these options involve moving something very heavy. It will cost you money, but unless you have experience in doing such things pay it. The money is a lot cheaper